Institute for Energy

Safety and Environmental Annual Report 2004

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Mission of the Institute for Energy

The Institute for Energy provides scientific and technical support for the conception, development, implementation and monitoring of community policies related to energy.
Special emphasis is given to the security of energy supply and to sustainable and safe energy production.

European Commission
Directorate General Joint Research Centre (DG JRC)
Institute for Energy
Petten
The Netherlands

Contact:
Theo Timke Tel.: +31 (0) 224 56 5433
E-mail: theo.timke@jrc.nl

http://ie.jrc.cec.eu.int/

http://www.jrc.cec.eu.int/

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Safety & Environmental Annual Report 2004

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GLOSSARY

BHV	**"Bedrijfs Hulp Verlening" (Company Emergency Organisation)**
BNP	**"Bedrijfsnoodplan" (Company Emergency Plan)**
BNCT	**Boron Neutron Capture Therapy**
CPR	**"Commissie voor de Preventie van Rampen door gevaarlijke stoffen" (Committee for the prevention of disasters by dangerous goods: old guideline for storage of dangerous goods)**
ECN	**"Energy Centrum Nederland" (Netherlands Energy Research Foundation)**
EMS	**Environmental Management System**
HFR	**High Flux Reactor**
IE	**Institute for Energy**
INO	**"Interne Noodorganisatie" (Internal Emergency Plan)**
ISO	**International Organisation for Standardisation**
JRC	**Joint Research Centre**
NER	**"Nederlandse Emissie Richtlijn" (Dutch Emission Guideline)**
NRG	**Nuclear Research and consultancy Group**
H&S MS	**Health and Safety Management System**
OHSAS	**Occupational Health and Safety management System**
PGS	**"Publicatiereeks Gevaarlijke Stoffen" (Publication Series for Dangerous Goods: new guideline for storage of dangerous goods)**
RBP	**"Rampbestrijdingsplan" (Disaster Fighting Plan)**
RNPK	**"Revitalisatie Nationaal Plan Kerngevallen" (Revitalisation National Nuclear Emergencies Plan)**
SES	**Safety, Environment, Security**
Wm	**"Wet milieubeheer" (Environmental Management Act)**
Wvo	**"Wet verontreiniging oppervlaktewateren" (Surface water pollution Act)**

PURPOSE:

This is the first integrated safety and environmental annual report of the JRC-IE. The report describes safety and environmental activities, targets, impacts and the management system of the Institute. This report will be published annually.

FOREWORD

The Institute for Energy (IE), situated in Petten, The Netherlands, is one of the seven research institutes of the Directorate General Joint Research Centre (DG JRC) of the European Commission. The population of the Institute is made up of personnel who originate from 22 out of the 25 European Union Member States plus Romania and Bulgaria. It also includes a number of visiting staff who come from non-EU countries. The total number of staff in Petten varies between 200 and 220.

The activities of the Institute for Energy encompass:

- Nuclear safety in the enlarged EU and support for nuclear safety in the Newly Independent States (NIS) of the former Union of Soviet Socialist Republics (TACIS Nuclear Safety Programme) and in the Central and Eastern European Countries (CEEC) (PHARE Nuclear programme);
- Safety of innovative nuclear energy systems;
- Clean and efficient waste incineration; waste to energy and biomass combustion; clean energy conversion and alternative fuels, focussing on hydrogen;
- Harmonisation and validation of safety and performance assessment of fuel cells and hydrogen storage technology.

All of these actions support the EU policy for a cleaner environment. These actions also involve networking activities, in line with the Commission's initiative for a European Research Area (ERA).

The Institute has research laboratories for the characterisation, testing and analysis of various materials, components, products and processes. As a reference laboratory, IE also validates different kinds of testing methods.

JRC-IE is the owner and licence holder of the High Flux Reactor (HFR), which is located on the Petten site and operated by the Dutch company Nuclear Research and consultancy Group (NRG). The operational licence is under renewal with a view to updating it and granting it to NRG in early 2005.

The reactor is used for material and fuel irradiation in support of the design of more effective and safer nuclear power plants. It is also used for transmutation studies aimed at reducing nuclear waste. Medical applications of the HFR include the treatment of tumour patients using Boron Neutron Capture Therapy (BNCT). NRG exploits the reactor for the production of radioisotopes for medical purposes.

The JRC-IE complies with Dutch and European environmental legislation. The Institute has certified ISO 9001 (2000) and ISO 14001 (1996) Quality and Environmental Management Systems.

Petten, June 16, 2005

Kari Törrönen
Director

1. Policy on Safety, Health and Well-Being at Work

In 2004 the management of the Institute added a new policy to the existing Quality and Environment policies, the policy for Safety, Health and Well-Being. This new policy is intended to show to the employees working on-site, as well as to third parties, how the Institute manages Safety, Health and Well-Being at work.

POLICY

On Safety, Health and Well-Being at Work

The Joint Research Centre – Institute for Energy (JRC-IE) of the European Commission protects the safety, health and well-being of its employees and all other individuals who may be present on its premises.

The management of JRC-IE has adopted a pro-active approach to reduce the risks to health, safety and well-being by:

- Developing a coherent overall prevention policy, which covers technology, work organization, working conditions, social relationships and the influence of external factors;
- Complying with the relevant requirements of applicable legislation and regulations as well as with the other international standards and codes;
- Continuous attention and pro-active approach to the further reduction and prevention of health risks;
- Awareness rising among the staff on the need to continuous improve the work environment.

The policy on health, safety and well-being at work is integrated into the JRC-IE management System. In the following years the main goals are:

- Regular updating of the Institute's safety handbook.
- Persistent improving health, safety and well-being management.
- Obtaining certification for the Institute's safety management system by an authorised body.
- Identify and control potential risks.
- Setting up a performance indicator system.
- Improving internal and external communication.

This policy is in line with the safety policy of the High Flux Reactor (HFR)

By signing this policy, the management of the JRC-IE wishes to demonstrate its commitment to efforts that will lead to the constant improvement of health, safety and well-being at work.

The JRC-IE management expects all employees, as well as third parties working on-site, to strive to achieve these targets.

2. Safety, Health and Well-Being related activities

2.1. Background

The Safety, Health and Well-Being of all persons on site at the Institute has always been a focus point of the management. In 2004 the management decided to replace the existing general site safety regulations by an OHSAS 18001[1] based **S**afety and **H**ealth **M**anagement **S**ystem (S&H MS).
This integrated safety and environmental annual report is one step in the process of developing and implementing the S&H MS.

2.2. Safety, Health and Well-Being items 2004

2.2.1. Near accidents, accidents and absences due to illness

In 2004 eight near accidents or accidents were reported. Only one resulted in a consultation with a general practitioner. No accident requiring a report to the authorities has taken place. The overall absence due to illness was 2.6% in 2004.

2.2.2. Emergency readiness

Three emergency scenarios are defined at the Petten research location as indicated in Table 1 together with relevant documents defining the actions to be taken.

Table 1 Emergency scaling

Emergency scenario	Scale	Document
Company	JRC-IE	Company Emergency Plan [Bedrijfsnoodplan (BNP)]
Site	Petten research location	Internal Emergency Plan [Interne Noodorganisatie (INO)]
Off site	Municipality Zijpe	Disaster Repression Plan [Rampbestrijdingsplan (Rbp)]

To increase the emergency awareness of all staff, exercises at all three levels have been carried out. Evacuation exercises were held in all buildings of the JRC-IE.
An accident scenario in building 310 was used in an INO exercise and in a tabletop exercise.
In the frame of the Disaster Repression Plan, a communication exercise was held.
Representatives of the Institute were also participating in information meetings on the "Revitalisatie Nationaal Plan Kernongevallenbestrijding (RNPK)".

[1] An international occupational health and safety management system specification, embracing BS8800, AS/NZ 4801, NSAI SR 320 and a number of other publications, developed to be compatible with the ISO 9001 (Quality) and ISO 14001 (Environmental) management systems standards.

2.2.3. Safety related training and instructions

The JRC-IE organized internal and external training for its staff as shown in Table 2.

Table 2 Safety related training of JRC-IE staff

Emergency Training	Specific tools	Specific procedures
First Aid (Refreshment)	Fork lift truck	Working with chemicals
BHV (Refreshment)	Crane and lifting device operator	Working with gases under pressure
Use of Self-Contained Compressed Air Breathing Apparatus (SCBA)		External Safety
		Risk assessment in laboratories
		Fire Safety in buildings
		Radioprotection

Furthermore, each newcomer receives general safety instructions specific to the Petten research location. Job-specific instructions are given by the Unit/Sector to which he/she belongs. Contractors and external companies working at the JRC-IE received the document W 380-1 “Safety regulations for third parties working at the JRC-IE Petten site”.

2.2.4. Inspections and Audits

At the Institute, various internal and external persons frequently carry out both planned and unplanned inspections and audits. The Director, the Heads of Unit, the SES Sector Head and internal auditors carry out regular inspections.
The Medical Service of the European Commission (Luxembourg), representatives of the fire insurers, external auditors, the municipality and other inspection services of national authorities visited the Institute on several occasions.
Inspection reports were always accompanied by action plans.

2.2.5. Medical supervision

The staff of the Institute are under the medical supervision of the Medical Service of the European Commission. The medical doctor and his staff visited the Petten site regularly for the annual medical check of the workers. An additional visit of the medical services was made to inform staff of the health risks of tobacco consumption.

2.2.6. Radiological workers

About 25% of the JRC-IE staff are radiological workers. The measurement and registration of their exposure to ionising radiation is made by NRG.
The figures presenting a summary of the individual monitored doses of the exposed staff are shown in Table 3. All doses were well below the legal limits.

Table 3 Dose of exposed people

Year	Number of staff	Dose (mSv)	
		Sum of individual doses	Highest individual dose
2002	52	3.26	0.33
2003	56	2.76	0.29
2004	55	10.27*	0.92

*During 3 months of 2004 the monthly totals were unusually high, an explanation has not yet been found.

2.2.7. Safety, Health & Environmental committee

The Safety, Health & Environmental Committee of the Institute comprises of eight staff, nominated equally by the personnel representatives and the Director. The main task of the committee is to advise the management on safety matters.
The frequency of meetings is once a month with the exception of the main vacation periods. In 2004 the Committee had nine meetings.

3. FUTURE DEVELOPMENTS IN SAFETY, HEALTH AND WELL-BEING

The development of a Safety, Health and Well-Being management system is the main aim for the years 2005-2006. The plan of the activities and the time schedule are presented in Table 4. The other targets are related to:

- Safety culture;
- Increasing the awareness of safety issues by training;
- Emergency preparedness;
- Work instruction on safety items at Institute level;
- Risk assessment at workplaces
- Reduction of the risk levels at the JRC-IE;

Table 4 Plan for the JRC-IE Safety, Health and Well-Being Management System

Activity	**Time schedule/deadline**
Annual Safety and Environmental Report 2004	June 2005
Risk assessment in the laboratories	July 2005
Establishment of a Risk Index and actualisation method	September 2005
Definition of SHE tasks, responsibilities and authorities	October 2005
The development of OHSAS 18001 based S&H MS	October 2005
Development of procedures and instructions for the S&H MS	October 2005– December 2005
Composition of S&H handbook	January 2006 – December 2006
Legal Requirements Index	April 2006
Implementation of S&H MS	January 2006– May 2006
Certification audit for the S&H MS	June 2006– July 2006
Annual internal audits of the S&H MS	2005 – 2006 (ongoing activity)
Evaluation of training needs for S&H	Ongoing activity

4. ENVIRONMENTAL ACTIVITIES

4.1. Background

In February 2004, Det Norske Veritas (DNV) honoured JRC-IE efforts in the development of an Environmental Management System (EMS) by granting a certificate for the IE EMS based on ISO 14001:1996 standard.

Certification of the EMS was a key requirement of the local municipality when the application for the **new** environmental permit, according to the "Wet milieubeheer (Wm)",was prepared.

In cooperation with the responsible authorities the licence requests for a wastewater licence ("Wvo vergunning") and an environmental licence ("Wm vergunning") were prepared and submitted. Allowing for the two periods of publication for objections and appeals, the licences would be granted in spring 2005.

4.2. Environment related training and instructions

Staff members of the Institute have participated in training for internal environmental auditors (ISO 14001). One person has followed a course for environmental coordinator, another an introduction course on environmental law.
Similar to safety, each newcomer receives a general instruction on the EMS system and related work instructions. The Unit/Sector to which he/she belongs provides Job specific instructions for the newcomer.

4.3. The main operational items in 2005

The ongoing research activities of the Institute are carried out within the 6th R&TD Framework Program of the European Commission, running 2003-2006. For two major new installations, the fuel-cell testing facility and the hydrogen storage testing facility, the local authorities have granted the construction licence and the environmental licence. The construction of the installations will be finished in the summer of 2005.
Besides the scientific projects, the municipality granted the building licence for the renovation of the façade of building 310. The JRC-IE expects some energy savings from this work.

4.3. Status of environmental goals from 2004

The status of the environmental activities at the end of 2004 was the following:

Goal 2004	**Status end of 2004**
Obtaining the environmental permit according to "Wet milieubeheer"	Application sent
Obtaining the new licence according to "Wet verontreiniging oppervlakte water"	Application sent
Maintaining the ISO 14001 certificate in two external audits	Done
Drawing up and publishing the annual environmental report	Completed in May
Evaluate the possibility of a separate sewer system for the chemical	Done

Goal 2004	Status end of 2004
laboratories in building 312	
Launch a call for tender to select a company to evaluate JRC-IE compliance with the environmental licence and legislation	Postponed to 2005, awaiting the granting of licence
Drawing up a long-range plan to replace the freon in the cooling systems	Pending
Comparison of the storage of hazardous substances against the new CPR 15-1 directive	Postponed, new directive not published
Prepare and implement a Work Instruction on "Working with solvents"	Pending
Installation of a geo-thermal cooling system for the fuel-cell testing facility	Done

Some of the environmental activities presented as goals in the Environmental Report 2003 were fulfilled but are considered as standard objectives. These are:

- Drawing up and publishing the annual environmental reports
- Communication on environmental results and enhancement of environmental awareness
- Monitoring the drainage system, including the filters

5. ENVIRONMENTAL IMPACTS

5.1. Energy consumption

JRC-IE uses electricity and natural gas as energy sources. The gas heating systems are of energy saving (high efficiency) type. Maintenance of the heating system is done annually. The figures presenting the consumption of gas and electricity are shown in Table 5.

Table 5 Consumption of gas and electricity

Year	Gas (m3)	Electricity (kWh) (excl. HFR)	Number of days with temperature < 0 °C
2001	500 791	2 822 800	69
2002	472 459	2 212 067	46
2003	484 695	2 854 854	81
2004	435 324	2 932 122	68

The number of staff members and the weather conditions influence the variation in the annual consumption.

5.2. Water consumption

The water consumption of the JRC-IE (excluding HFR) is shown in Table 6. The figures show that the efforts to reduce the water consumption have been successful over the last years. There is a major difference in the figures of the water consumption of the Institute between the readings of earlier years and the readings of 2004. The explanation for this is a

systematic error in the measuring system on the main supply for the Institute. In future the water consumption data from the JRC-IE building management system will be used.

Table 6 Consumption of water

Year	Water (m^3)
2001	13 415
2002	11 198
2003	9 238
2004	4 402

5.3. Emissions to water

The laboratories are the main source of emissions to water. These emissions are analysed annually by an external company. The analysis method is based on sampling of the total drain water flow during one week. In 2004 the samples were taken in the period from 27 October till 3 November. The analysis covers organic wastes, chloride and heavy metals. The release of heavy metals to the drain system is presented in Table 7.

Table 7 Release of heavy metals to the drain system

Metal	Concentration (mg/m^3)			
	2001	2002	2003	2004
Cadmium (Cd)	< 2.0	< 2.0	< 2.0	< 1.0
Chromium (Cr)	7.5	< 5.0	6.8	< 5.0
Copper (Cu)	190	74	140	54
Nickel (Ni)	10	< 5.0	< 5.0	< 5.0
Lead (Pb)	36	< 5	12	< 5
Zinc (Zn)	150	63	96	70
Mercury (Hg)	0.28	0.16	0.11	< 0.1
Arsenic (As)	< 5.0	< 5	< 5	< 2
Tin (Sn)	< 10	< 10	< 10	< 10

The licence limits are (mg/m^3):
Mercury: 10
Cadmium: 20
Other metals: 5000

The results show that emissions are within the limits of the permit. According to the analysing company the relatively high concentration of copper and zinc originates from the water piping system.

The emissions of inorganic substances to the draining system are measured using the same method as with heavy metals. The figures are presented in Table 8.

Table 8 Inorganic emissions to the drain system

Substance	Concentration (g/m^3)		
	2002	2003	2004
Chloride(Cl^-)	360	260	190

The values do not exceed the acceptable pollution limits. The limit values are currently not defined in the environmental licence. Typical limit value for chloride is 350 g/m^3.

5.4. Emissions to air

Emissions to the air consist primarily of small amounts of process gases and noble gases from the research laboratories.

JRC-IE has eight material testing research laboratories and the same number of support laboratories. These laboratories test components and test pieces of power plants and petrochemical plants under simulated conditions (elevated temperatures, high pressure, toxic and explosive environments) for creep, fracture and thermal fatigue. These laboratories use inert gases (Helium, Neon, Argon, Nitrogen) and process gases (Hydrogen). In addition, gas mixtures of Argon, Nitrogen or air with gases presented in Table 9 are used (except SF_6). The SF_6 is used to produce an isolating atmosphere in some measurement equipment.

Some of the gases used in testing laboratories have environmental effects. The consumption of these bottled gases for the year 2004 is shown in Table 9.

Table 9 Amount of gases with environmental effect

Substance	Emission of JRC-IE			NeR-reference			
	kg/year	Emission hours/ year	g/hour	NeR category	Limit value (g/hour)	Max concentration (mg/m^3)	Remarks
HCl	0,074	1400	< 0.1	gA.3	150	10 30	Uncleaned concentration < 1 g/m^3 Uncleaned concentration > 1 g/m^3
CO_2	21	1400	15	-	-	-	No NeR requirements
CO	0,7	1400	< 0,1	MVP1/MVP2			Minimization required
H_2	1,8	1200	1.6	-	-	-	No NeR requirements
H_2S	0,15	1500	0,1	gA.2	15	3	
SF_6	0,5	8760	< 0.1	gA.3	300	30	

The use of these gases has not produced any health problems to the JRC-IE personnel or to the public in the surrounding area. No smell problems have been reported. The emission values are below the values defined in the Netherlands Emission Guidelines for Air (NeR).

5.5. Noise

No complaints related to noise were made by third parties.

The activities carried out at JRC-IE do not produce noise levels that would be harmful to the surrounding population or the environment.

5.6. Nuclear aspects

JRC-IE follows regularly the environmental aspects of the HFR operation. The environmental behaviour of the operating company NRG is reviewed quarterly. An independent expert does this by checking the NRG health physics reports.

5.7. Waste

The JRC-IE is trying to get a better view of its waste production; therefore it has started to weigh the ‘household’ waste and paper. In 2003 the amount of waste monitored was based on the volume of containers removed.

In the frame of the site cleaning, several old machines and installations have been disposed of.

The type of waste produced, and the collected amounts are presented in Table 10.

Table 10 Type of waste by volume or weight

Type of waste	2003	2004
	Amount (m^3)	Amount
Household waste	1250	36.5 t
Paper and cardboard	350	28 t
Wood	30	60 m^3
Glass	6	3 m^3
Metal	80	100 m^3
Electrical appliances (audiovisual and household)	30	30 m^3 (ca 7,5t)

*) Figures are based on the volumes of the containers

Chemical waste

Chemicals including paints, batteries, solvents and acids are collected centrally at a chemical waste store. At regular intervals a certified waste treatment company collects the chemical waste from the store.

Small chemical waste (batteries and cartridges) is not only originating from the IE activities, as staff members are using the collection bin for their old private batteries and cartridges as well. On the initiative of staff members a major part of the revenue originating from this waste is going to a charitable purposes, a school in the region. The school is getting subsidy for the collected batteries and cartridges to finance projects.

In 2004 the amount of chemical waste was lower than in the previous year due to a better management of the chemical resources. The amount of chemical waste is dependent on the activities in the laboratories.

The types of waste and the amounts are specified in Table 11.

Table 11 Type of waste by weight

Type of waste	2003	2004
	Amount (kg)	Amount (kg)
Small chemical:		
Batteries	200	160
Cartridges	250 pieces	300
Laboratory mixed waste	600	0
Oil filters; oil containing products	184	60
Solvents	211	86
Spray containers, paint	138	90
Developer	715	272
Oil	35	117
Acid	369	14
Sodium/potassium	6.5	0

Hydraulic oil is collected and disposed of as part of the maintenance contract of each machine and equipment.

6. ENVIRONMENTAL GOALS FOR 2005

The JRC-IE has formulated the following environmental goals for the year 2005. Progress towards the goals is monitored continuously. The achievements will be reviewed in spring 2006 and the results reported in the Annual Safety & Environmental report.

- Maintaining the ISO 14001 certificate;
- Drawing up and publishing the annual safety and environmental report;
- Comparing the storage of hazardous substances against the new PGS 15 directive;
- Monitoring the drainage system, including the filters;
- Launching a call for tender to select a company which evaluates the JRC-IE compliance with the environmental licence and legislation
- Preparing and implementing a Work Instruction on “Working with solvents”
- Communicating on (interim) safety and environmental results and enhancement of environmental awareness
- Drawing up a long-range plan to replace freon in the cooling systems

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Abstract

The IE Safety & Environmental Annual Report 2004 describes the health, safety and well-being as well as the environmental activities, targets, impacts and management system of the JRC's Institute for Energy in Petten.

The target group of the report are the local authorities, research partners and other groups interested in safety and environmental performance of the Institute for Energy.

The mission of the Joint Research Centre is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of E U policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States,while being independent of special interests, whether private or national.